

A NEW SPECIES OF *ELEUTHERODACTYLUS* (ANURA:
LEPTODACTYLIDAE) FROM THE CORDILLERA
ORIENTAL OF COLOMBIA

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The high Andes of northern South America support a distinctive vegetational formation, the páramo, characterized by a variety of low herbaceous plants, bunch grasses, cushion plants, some low woody bushes (*Baccharis*, Compositae), and the endemic composite *Espeletia*. Páramo occurs principally at elevations above 3,000 m, although in some areas it descends to about 2,500 m. The páramos receive abundant precipitation throughout the year; at higher elevations part of the precipitation falls as snow. Páramo communities are most extensive in Colombia and Ecuador and also occur in the Mérida Andes of Venezuela.

In contrast with adjacent lower montane habitats, the herpetofauna of the páramos is depauperate, consisting mostly of anurans of the genera *Atelopus*, *Colostethus*, *Eleutherodactylus*, *Gastrotheca*, and *Phrynopus*, although species of salamanders (*Bolitoglossa*), teiid lizards (*Anadia*), and one other frog (*Hyla labialis*) do occur in the páramos in Colombia. Among the herpetological inhabitants of the Colombian páramos, the genus *Eleutherodactylus* is the most diverse in numbers of species. Frogs of this genus provide excellent subjects for the study of patterns of speciation in the páramos, which are distinctive habitat islands scattered through the three ranges of the Andes in Colombia. The frogs under consideration here are from the eastern range, the Cordillera Oriental.

Upon studying large series of eleutherodactyline frogs obtained in the course of a survey of herpetological communities in the páramos in 1974, we discovered that one species well represented in our collections was unnamed. We take this opportunity to name this species for our friend and colleague, John D. Lynch of the University of Nebraska, in recognition of his devotion to the systematics of *Eleutherodactylus*.

Eleutherodactylus lynchi, new species

Fig. 1

Holotype.—KU 168139, an adult female, from Vado Hondo (05°26'N, 72°44'W), 2660 m, Departamento Boyacá, Colombia, one of a series obtained on 28 August 1974 by William E. Duellman, Dana K. Duellman, John E. Simmons, and Linda Trueb.

Paratopotypes.—FMNH 202672-77, KU 168140-98, 168204-301, RMNH 17815(6), MLS 469-472, INDERENA (4), same collectors, 28 August-2 September 1974.

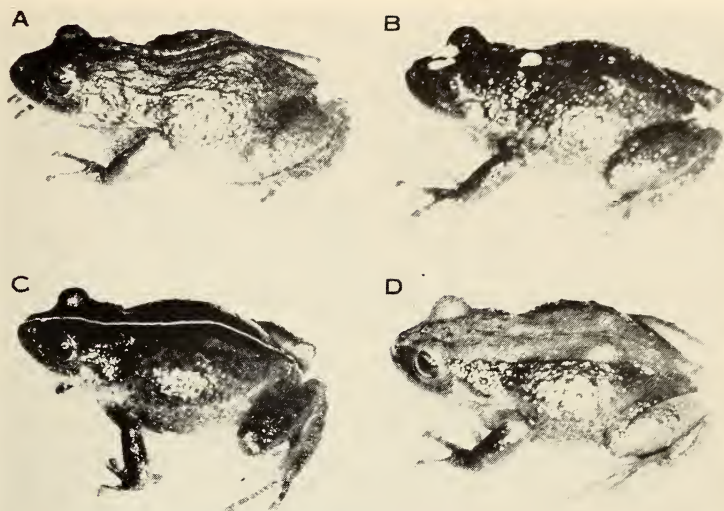


Fig. 1. Variation in color pattern in *Eleutherodactylus lynchi*: a, KU 168139 (holotype), ♀, 29.9 mm SVL; b, KU 168140, ♀, 28.1 mm; c, KU 168141, ♀, 31.4 mm; d, KU 168142, ♀, 30.3 mm.

Diagnosis.—A member of the *Eleutherodactylus unistrigatus* group, characterized by: (1) skin on dorsum shagreened with scattered low granules, on belly coarsely granular; (2) snout subacuminate in dorsal view and round in profile, barely protruding beyond margin of lip; (3) width of eyelid about two-thirds of interorbital distance; (4) cranial ridges absent; (5) tympanum round with a moderately heavy supratympanic fold; (6) first finger slightly shorter than second; (7) fingers bearing lateral fringes; (8) terminal digital discs expanded, truncate; width of disc on third finger equal to diameter of tympanum; (9) palmar tubercle moderately small, elliptical; (10) forearm bearing ventrolateral row of low tubercles; (11) tarsus having scattered low tubercles, inner tarsal fold curved on distal two-fifths of tarsus; (12) inner metatarsal tubercle large, ovoid; outer metatarsal tubercle small, conical; (13) toes bearing lateral fringes and expanded terminal discs; outer toes webbed basally; (14) prevomerine odontophores small, behind level of choanae; (15) vocal slits and median subgular vocal sac present; (16) dorsum brown or tan with or without darker or paler markings; venter cream with or without brown flecks on chin and chest; upper lips and posterior surfaces of thighs plain brown.

Eleutherodactylus lynchi differs from all other eleutherodactylines known from the high elevations of the Cordillera Oriental by having small prevomerine odontophores covered by buccal lining; in the other species the odontophores are distinct and larger. Furthermore, *E. lynchi* has expanded

terminal discs on the digits, which distinguish it from *E. nicefori* and *Phrynopus nanus*, both of which have narrow digital tips; the latter also lacks a tympanum. From the remaining species of *Eleutherodactylus* in the Cordillera Oriental, *E. lynchi* differs by having a curved tarsal fold that is continuous with the inner metatarsal tubercle. In *E. bogotensis* and *E. vertebralis* the tarsal fold is short, straight and separated from the inner metatarsal tubercle; the tarsal fold is absent in *E. affinis* and *E. elegans*.

Description.—Body robust; head slightly wider than long; snout subacuminate in dorsal view, round in profile; snout barely protruding beyond margin of lip; top of head flat; width of eyelid about two-thirds of interorbital distance; canthus rounded; loreal region barely concave; nostrils slightly protuberant dorsolaterally; internarial area flat; lips not flared. Tympanum round, distinct, separated from eye by distance equal to diameter of tympanum, bordered above by moderately heavy supratympanic fold.

Forearm moderately robust, bearing ventrolaterally a row of low tubercles; first finger slightly shorter than second; fingers having lateral fringes extending to discs, which are nearly twice as wide as digit; subarticular tubercles large, subconical; palmar tubercle moderately small, elliptical; pollical tubercle elongate. Hind limbs short, robust; row of low tubercles on ventrolateral edge of tarsus; inner tarsal fold distinct, curved, on distal two-fifths of tarsus; inner metatarsal tubercle moderately large, ovoid; outer metatarsal tubercle subconical; toes slender, bearing lateral fringes; discs expanded, slightly smaller than those on fingers; subarticular tubercles small, subconical.

Skin on dorsum shagreened with scattered small granules; mixture of large and small granules on flanks; two or three large round tubercles posteroventral to tympanum; skin on belly and ventral surfaces of thighs granular; skin elsewhere smooth. Anal opening a puckered aperture at midlevel of thighs, bordered laterally and ventrally by small tubercles. Prevomerine odontophores small, inconspicuous, covered by buccal lining, inclined posterolaterally behind the posterior borders of small, ovoid choanae. Vocal slits and single median subgular vocal sac present.

Coloration in preservative.—The dorsum varies from tan to dark brown. Four color morphs can be discerned in the 240 known specimens: (1) Dorsum tan to brown with small irregular darker brown spots (62%); (2) Same as preceding except having a pale spot on the snout and another in the scapular area (13%); (3) Dorsum pale tan with or without brown streaks; flanks dark brown (20%); (4) Dorsum dark brown; flanks tan (5%). A narrow cream middorsal line is present in 9.6% of the specimens. The venter is cream; the posterior surfaces of the thighs are uniform brown.

Coloration in life.—The dorsum is dark brown with or without tan spots or cream middorsal line, or olive-green, tan, or orange-red with dark brown flanks. The posterior surfaces of the thighs are orange-brown; the belly is

Table 1. Snout-vent length (SVL) and proportions of *Eleutherodactylus lynchi*. First line is range of variation; second line is mean ± 1 standard deviation.

Locality	Sex	N	SVL	Tibia length/ SVL	Foot length/ SVL	Head length/ SVL	Head width/ SVL	Tympanum/ Eye
Vado Hondo	♂	17	22.6-27.9	.383-.456	.409-.473	.352-.380	.348-.402	.385-.586
			24.5 \pm 1.51	.412 \pm .019	.441 \pm .021	.366 \pm .009	.376 \pm .012	.444 \pm .052
	♀	25	26.7-31.8	.376-.443	.399-.458	.350-.422	.374-.412	.290-.563
			28.6 \pm 1.20	.406 \pm .017	.429 \pm .014	.376 \pm .017	.388 \pm .010	.421 \pm .067
Belén	♂	9	23.3-27.5	.388-.438	.380-.451	.356-.380	.362-.388	.394-.485
			25.9 \pm 1.28	.410 \pm .013	.418 \pm .020	.367 \pm .073	.375 \pm .008	.442 \pm .033
	♀	3	29.6-33.2	.392-.456	.431-.453	.355-.378	.368-.399	.382-.457
			31.5	.425	.444	.365	.379	.424
Susacón	♂	4	21.0-27.2	.400-.434	.428-.443	.371-.386	.371-.395	.357-.441
			25.5	.414	.435	.380	.383	.395
	♀	17	29.3-36.4	.371-.451	.406-.471	.335-.371	.356-.403	.375-.514
			32.6 \pm 1.49	.408 \pm .021	.432 \pm .018	.356 \pm .012	.388 \pm .013	.411 \pm .041

gray, and the vocal sac is dull yellow. The iris is dull bronze with a median horizontal brown streak.

Measurements.—The holotype, an adult female, has the following dimensions (in mm): snout-vent length 29.9, tibia length 12.4, foot length 13.7, head length 11.4, head width 12.1, diameter of eye 3.7, diameter of tympanum 1.3. Measurements and proportions of series from three localities show little variation (Table 1).

Distribution.—The type-locality is in the southeastern part of the Páramo de Vigajual; *Eleutherodactylus lynchi* was found at 2,460 m, 6 km S of Vado Hondo and at 3,150 m, 20.5 km NW of Vado Hondo, both in the Páramo de Vigajual. The species was also collected in the Páramo de la Rusia (3,340 m), 19 km NW of Duitama and in páramos 22 km SSW of Susacón (3,000 m) and 33 km NE of Belén (2,880 m). All localities are in the Cordillera Oriental in the Departamento de Boyacá.

Remarks.—*Eleutherodactylus lynchi* belongs to Group II of the genus as defined by Cochran and Goin (1970) and to the large *Eleutherodactylus unistrigatus* group as defined by Lynch (1976). This group is most diverse in the Andes of Colombia and Ecuador. In the Cordillera Oriental this group is also represented by (1) *E. nicefori* in the Páramo del Almorzadero to the north of the range of *E. lynchi*; (2) *E. affinis*, *bogotensis*, and *elegans* in the páramos in the vicinity of Bogotá to the south of the range of *E. lynchi*; (3) *E. vertebralis* widespread in páramos, subpáramos, and upper montane forests in the three Colombian cordilleras southward into Ecuador. Only *E. vertebralis* occurs sympatrically with *E. lynchi* (Páramo de la Rusia).

Vado Hondo is a small (four houses) village on the road east of Sogamosa. Our study site was just north of the village, across the Río Cusiana. Along the northern and western sides of the river are steep slopes with granitic talus. The vegetation consists of grasses (partially grazed by cattle and goats), many lichens and mosses, and scattered clumps of *Espeletia* and *Baccharis*. In some areas mosses formed about 70% of the ground cover. During the five days that we spent at Vado Hondo the temperature varied from nocturnal lows of 4.0–7.0 (\bar{x} = 5.4)°C to diurnal highs of 12.0–19.5 (\bar{x} = 13.7)°C. Rain fell daily, accumulating to 6–16 (\bar{x} = 12.2) mm daily.

Although some specimens of *E. lynchi* were on the valley floor, most were under rocks on, or at the base of, the south and east facing slopes. All were found by day. Six females having snout-vent lengths of 26.6–33.3 (\bar{x} = 30.1) mm contained 6–16 (\bar{x} = 10.8) unpigmented ovarian eggs 1.2–1.8 (\bar{x} = 1.5) mm in diameter. The testes are white in 75% of the adult males and heavily spotted with black or entirely black in the others.

At Vado Hondo and Páramo de la Rusia *E. lynchi* is a member of a herpetofaunal community containing four other species of frogs (*Atelopus ebenoides*, *Colostethus subpunctatus*, *Hyla labialis*, *Phrynopus nanus*) and one salamander (*Bolitoglossa* sp.). *Eleutherodactylus vertebralis* is also present at Páramo de la Rusia.

Specimens examined.—Abbreviations: Field Museum of Natural History (FMNH), Instituto Desarrollo de los Recursos Naturales Renovables, Bogotá (INDERENA), University of Kansas Museum of Natural History (KU), Museo de la Salle, Bogotá (MLS), Rijksmuseum van Natuurlijke Historie (RMNH), University of Michigan Museum of Zoology (UMMZ). All specimens are from Colombia.

E. affinis: Cundinamarca: Barranquilla, UMMZ 57495.

E. bogotensis: Cundinamarca: 11 km E Bogotá (road to Choachí), KU 124693-739; Cerro Monserrate, Bogotá, KU 110383-407, 124688-92; El Verjón, KU 150708-09.

E. elegans: Cundinamarca: 11 km E Bogotá, KU 124740-41; 15 km E Bogotá, KU 132630.

E. lynchi: Boyacá: 33 km NE Belén, KU 168348-60; Páramo de la Rusia, 19 km NW of Duitama, KU 168361-63; 22 km SSW Susacón, KU 168315-47; Vado Hondo, FMNH 202672-77, INDERENA (4), KU 168139-98, 168204-301, MLS 469-472, RMNH 17815(6); 6 km S Vado Hondo, KU 168302-14; 20.5 km NW Vado Hondo, KU 168364-83.

E. nicefori: Norte de Santander: 18.5 km S Chitagá, KU 168445-80; 32 km S Chitagá, FMNH 202678-83, KU 168481-516, RMNH 17811(4). Santander: Chitagá: 150710-13; Páramo del Almorzadero, KU 150714-24.

E. vertebralis: Antioquia: Sonsón, KU 150733. Boyacá: Páramo de la Rusia, 19 km NW Duitama, KU 168625. Nariño: N shore Lago de la Cocha, KU 168643; La Victoria, KU 140308-09. 8 km NE Pasto, KU 168640; 12 km E Pasto, KU 168641-42. Norte de Santander: 18.5 km S Chitagá, KU 168626-30; 32 km S Chitagá, KU 168631-39. Santander: 35 km ENE Bucaramanga, KU 132722-23; Páramo del Almorzadero, KU 150731-32; Presidente, KU 150727-30.

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